TEST EQUIPMENT

OPERATION & MAINTENANCE HANDBOOK

VERSATESTER I™

Part Number 37001-411

SYSTRON-DONNER CORPORATION

DATAPULSE

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HANDBOOK

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DATAPULSE
DIVISION
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CORPORATION

10150 W. JEFFERSON BLVD., CULVER CITY, CALIFORNIA 90230

FIRST EDITION

Preliminary Printing – December 1973
Reprint – January 1974

MEASUREMENT

DC VOLTAGE

DC Ranges: ±0.5V, 5V, 50V and 500V
Resolution: 0.1 mv
Polarity: Automatic
Input Impedance: greater than 10 MΩ
Accuracy: ±(0.04% of reading +0.06% of range +1 digit)

FREQUENCY

Frequency Range: 20 Hz to 20 MHz
Display Digits: 4
Sensitivity: 100 mV, rms
Accuracy: ±1 digit
Input Impedance: greater than 1 MΩ
Coupling: AC
Gate Time: 100 ms, max.

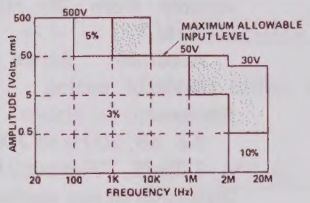
RESISTANCE

Range	Resolution	R_X Current
.5 KΩ	.1 Ω	1 ma
5 KΩ	1 Ω	100 μa
50 KΩ	10 Ω	10 μa
500 KΩ	100 Ω	1 μa
5 MΩ	1 KΩ	.1 μa

Accuracy: ±(0.5% of reading + 1 digit) to 500 KΩ;
±(1% of reading + 1 digit) to 5 MΩ

AC VOLTAGE

AC Ranges: 0.5V, 5V, 50V and 500V, rms
Resolution: 0.1 mV, rms
Input Impedance: >1 MΩ shunted by ~25 pf.
Accuracy (% of full scale) & Maximum Input:



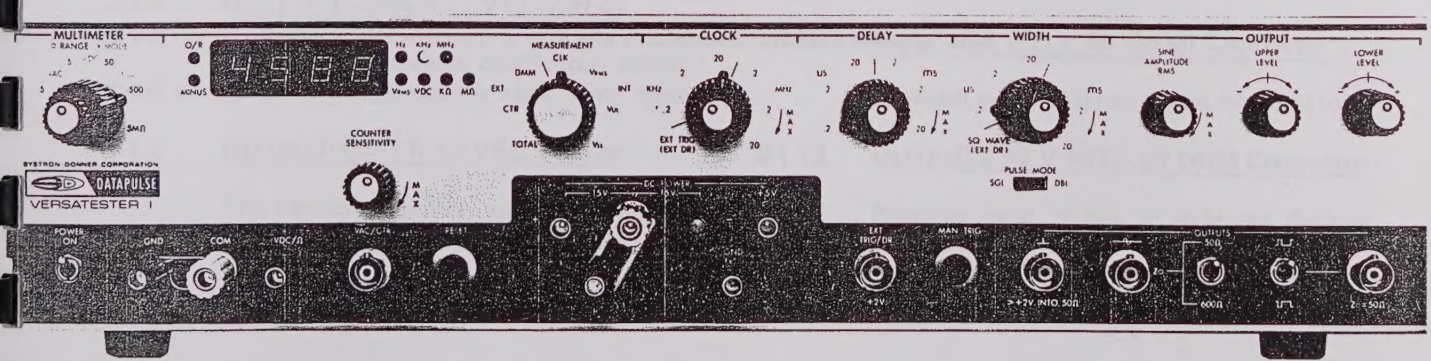
NOTE: The shaded areas represent amplitude / frequency combinations where no absolute accuracy is specified. They are useable, however, for comparison measurements, observation of voltage drift, reseting of voltage to pre-observed levels, etc.

The PLUS Values

VERSATESTER I™ offers the user a number of added extra features beyond its basic ability to generate signals and measure results.

- **TOTALIZE MODE** - The frequency counter may be used to totalize externally applied random events.
- **AUTORANGING** - The frequency counter autoranges to display the four most significant digits of the frequency being counted.
- **FAST READ-OUT OF LOW FREQUENCIES** - Phase-lock loop and frequency multiplication techniques are employed to provide instantaneous read-out of low frequencies.
- **INTERNAL MEASUREMENTS** -
  An INTERNAL CLOCK measurement mode allows precise setting of sinewave frequency and pulse or squarewave repetition rate to within the accuracy of the frequency counter.

  INTERNAL VOLTAGE measurement modes allow setting of sinewave amplitude to within ±(3% + 0.2V) rms + the accuracy of the AC Voltmeter, upper level of the pulse or squarewave to within ±(3% + 0.2V) and lower level of the pulse or squarewave to within ±(3% + 0.2V).



SOURCES

DC POWER

+5 Volts, ±2%
Voltage variation: ±1%
Ripple: <5mV
Current: >1 amp
Current limiting: ~1.25 amp
Short circuit current: ~0.8 amp

+15 Volts, ±2%
Voltage variation: ±1%
Ripple: <10mV
Current: >200mA
Current limiting: ~250 mA
Short circuit current: ~250 mA

–15 Volts, ±2%
Voltage variation: ±1%
Ripple: <10mV
Current: >200mA
Current limiting: ~250mA
Short circuit current: ~250mA

±30 Volts
The + and –15V supplies are floating with respect to chassis ground. +30V or –30V may be obtained by proper external grounding.

MISCELLANEOUS

Physical: 3½" X x 16 3/4" W x 16 3/4" D. Weight: 25 lbs net. Power: 110/220 VAC, 50/400 Hz, approx. 75W. Furnished with 1 set banana jack/alligator clip test leads and 1 Operation and Maintenance Manual.

SINEWAVES

Frequency: Continuously variable from 20 Hz to 20 MHz
Accuracy: Better than 0.1% of setting

Flatness:
0.5 dB, 20 Hz to 200 Hz
0.25 dB, 200 Hz to 2 MHz

Distortion (at max amplitude):
<2%, 20 Hz to 200 Hz
<0.5%, 200 Hz to 500 kHz
-40 dB to 2 MHz
-30 dB to 10 MHz

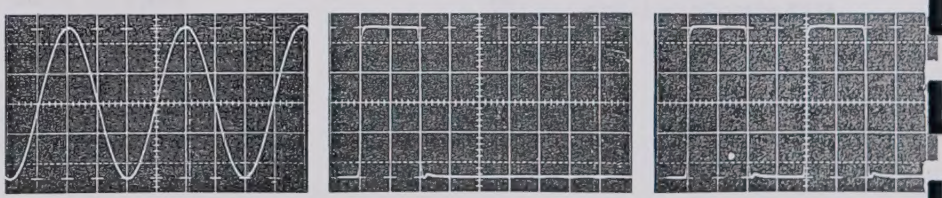
Hum and Noise (at max. amplitude):
-60 dB above 200 Hz

Output: 3V, rms, max, into a load equal to the selected source impedance with up to 30dB of attenuation.

Source Impedance: 50 or 600 ohms, selectable by front panel control.

PULSES SQUAREWAVES

All parameters are continuously variable
Repetition Rate: 20 Hz to 20 MHz
Accuracy: Better than ±0.1% of setting
Delay/Width (pulse only): 20 ns to 20 ms
Time/Symmetry (squarewave only): 95% to 10 MHz
Rise/Fall Time: Approx. 5 ns
V_{UL} (Upper Output Level): -4V to +5V into 50Ω (-8V to +10V, open ckt).
V_{LL} (Lower Output Level): -5V to +4V into 50Ω (-10V to +8V, open ckt).
Note: Max. difference between levels is 5V into 50Ω (10V open ckt).
Outputs: Positive-going pulse/squarewave or complement from a 50Ω source.
External Trigger: Pulses (to 20 MHz) may be triggered by +2V (zero volt baseline) >15 ns wide ext. trig. Max. input ±5V. Single pulse by front panel pushbutton.
External Drive: Establishes rise/fall time and upper/lower levels of an externally applied +2V, >15 ns wide. Max. input ±5V.
Pulse Pairs: Produces pulse pairs to >10 MHz. Pulse No. 2 is positioned by delay control.
Sync Output: >+2V into 50Ω (approx. zero volt baseline) approx. 15 ns wide.



Note: Sinewave is available simultaneously with pulse or squarewave except in the Ext. Trig or Ext. Drive modes.

SECTION II

CONTROLS AND CONNECTORS

This section lists the front panel controls and describes their functions.

2.1 PULSE GENERATOR

2.1.1 CLOCK Controls

The rotary selector sets the frequency range (or external triggering/external drive) and the vernier provides continuous control of frequency throughout the range selected. In the EXT TRIG position the sine wave oscillator is disabled and the instrument can be triggered by an external trigger source at the EXT TRIG/DR connector, or by the MAN TRIG pushbutton.

2.1.2 DELAY Controls

The rotary selector sets the delay range and the vernier provides continuous control within the range, varies the delay of the pulse output with respect to the sync pulse, and in double pulse mode delays the second pulse (with respect to the first).

2.1.3 WIDTH Controls

The rotary selector sets the width of the output pulse or selects the square wave mode and the vernier provides continuous control within the width range. In the SQ WAVE position the output has 50% duty cycle at the clock frequency selected.

2.1.4 OUTPUT/LOWER LEVEL Vernier

The vernier provides continuous adjustment of the pulse or the square wave lower level.

2.1.5 OUTPUT/UPPER LEVEL Vernier

The vernier provides continuous adjustment of the pulse or the square wave upper level.

2.1.6 SINE AMPLITUDE RMS Vernier

The vernier provides continuous adjustment of the sine wave output amplitude.

2.1.7 PULSE MODE Selector

Selects either single pulse or double pulse mode of operation.

2.1.8 OUTPUTS/⊓⊔–⊔⊓ Selector

Enables selection of either normal or inverted pulse (or square wave) to be supplied by the output.

2.1.9 OUTPUTS/Z_O–50 OHM/600 OHM Selector

Selects 50 or 600 ohm source impedance for the OUTPUT connector.

2.1.10 MAN TRIG Pushbutton

The pushbutton generates a single pulse (or double pulse) when the CLOCK selector is set to EXT TRIG/DR position.

2.1.11 OUTPUTS Connector

Supplies sine wave outputs to the external load.

2.1.12 OUTPUTS (Z_O = 50 OHM) Connector

Provides pulse outputs to the external load.

2.1.13 OUTPUTS +2 V INTO 50 OHM Connector

Provides sync pulses to external devices.

2.1.14 EXT TRIG/DR Connector

Input connector for external trigger and external drive signals.

2.2 POWER SUPPLIES

2.2.1 DC POWER/+15 V Jack

Supplies +15 V dc to external load (when load is returned to common).

2.2.2 DC POWER/-15 V Jack

Supplies -15 V dc to external load (when load is returned to common).

2.2.3 DC POWER/15 V Common Return Jack

Provides common return connection for +15 V and -15 V supplies. May be connected to DC POWER GND Jack when floating supplies are not desired.

2.2.4 DC POWER/+5 V Jack

Provides +5 V for external loads (when loads are returned to the DC POWER/GND Jack).

2.2.5 DC POWER/GND Jack

Provides ground return connection for the instrument.

2.3 MULTIMETER

2.3.1 MULTIMETER Selector

The selector sets the appropriate multimeter function (ac volts, dc volts, resistance) and the range.

2.3.2 VAC/CTR Connector

Input for waveforms to counter for signal count or totalizing and to DMM for ac measurements.

2.3.3 VDC/OHM Jack

Connects dc voltages or resistances to multimeter for measurement. Must be used in conjunction with DMM COM jack.

2.3.4 DMM COM Jack

Provides a return to instrument multimeter (must be disconnected from ground when making floating measurements).

2.3.5 Multimeter GND

Provides a convenient connection to chassis ground.

2.4 COUNTER

2.4.1 COUNTER SENSITIVITY Vernier

Adjusts the level at which the counter is triggered.

2.4.2 RESET Pushbutton

Resets instrument counter to read 0000.

2.5 MEASUREMENT MODES

2.5.1 MEASUREMENT Selector, LED Indicators and Annunicators

The selector has three external (EXT) positions (TOTAL, COUNTER, DMM) and four internal positions (CLOCK, V_{RMS}, V_{UL}, V_{LL}).

In CTR position the readout displays the frequency of the input applied to the VAC/CTR connector. The MULTIMETER selector switch must be in VAC position and the correct voltage range selected for proper counting.

In TOTAL position the readout displays the total number of pulses applied to the VAC/CTR connector. The MULTIMETER selector switch must

be in VAC position and the correct voltage range selected for proper totalizing.

In DMM position the readout displays the voltages or resistance applied to the VDC/OHM connector or VAC/CTR connector.

In CLOCK position the readout displays the frequency of the internally generated pulses, square waves and sine waves.

In V_{RMS} position the readout displays the amplitude of the sine wave at the Ω connector.

In V_{UL} and V_{LL} positions the readout displays the (upper level or lower level) voltage levels of the output pulse or square wave.

2.6 POWER SELECTOR

Applies ac voltage to the primary of the power transformer.

SECTION III

OPERATION

3.1 OPERATIONAL CHECK

The following procedure provides a brief operational check of the instrument and an introduction to its control functions.

3.1.1 Equipment (or equivalent) Required

a. A dual-trace, real-time oscilloscope with a 50 MHz bandpass. Tektronix Type 546 with a 1A2 plug-in unit recommended.

b. A trigger source with a 20 MHz repetition rate, variable width and variable amplitude. Systron-Donner Model 99 recommended.

c. Two 50 ohm, 2 watt coaxial terminations. Systron-Donner Model 452 recommended.

d. Two coaxial cables terminated with BNC connectors. Systron-Donner Part Number 36000-157.

CAUTION

Verify that position of the 115/230 volt selector on back panel agrees with line voltage before connecting power plug.

3.2 PULSE GENERATOR

3.2.1 Repetition Rate Check

a. Set instrument controls as follows:

Control	Setting
MEASUREMENT selector	CLK
CLOCK selector	20 MHz
CLOCK vernier	maximum clockwise
COUNTER SENSITIVITY vernier	maximum counterclockwise
MULTIMETER selector	AC

b. Observe display. It should be 20 MHz.

c. Complete check of pulse generator repetition rate check by performing steps indicated in Table 3-1.

Table 3-1. Repetition Rate Check

Repetition Range (CLOCK) Selector Range	Counter Indication* CLOCK Vernier maximum counterclockwise	CLOCK Vernier maximum clockwise
0.2 kHz	< 20 Hz	> 200 Hz
2 kHz	< 200 Hz	> 2 kHz
20 kHz	< 2 kHz	> 20 kHz
0.2 MHz	< 20 kHz	> 200 kHz
2 MHz	< 200 kHz	> 2 MHz
20 MHz	< 2 MHz	> 20 MHz

*Provision is made for continuous overlap of ranges and not accuracy of individual range.

3.2.2 Pulse Output and Square Wave Width Check*

a. Monitor OUTPUT (Z_O = 50 OHM) connector with real-time oscilloscope.

Sync oscilloscope with > +2 V into 50 ohm output. Make both connections through coaxial cables terminated with 50 ohm, 2 watt terminations (at the oscilloscope).

b. Set instrument controls as follows:

Control	Setting
CLOCK selector	2 MHz
CLOCK vernier	maximum clockwise
DELAY selector	0.2 μs
DELAY vernier	maximum counterclockwise
WIDTH selector	0.2 μs
WIDTH vernier	mid-range
OUTPUT/LOWER LEVEL vernier	mid-range
OUTPUT/UPPER LEVEL vernier	maximum clockwise
PULSE MODE selector	SGL
OUTPUT/ selector	

c. Verify that oscilloscope displays 2 MHz pulse with width of approximately 0.1 μs and amplitude of 5 V (approximately).

d. Set OUTPUT/ selector to and verify that pulses are approximately 5 V amplitude but inverted. Return OUTPUT selector to .

e. Rotate OUTPUT UPPER LEVEL vernier to mid-point and observe that pulse level decreases. Rotate OUTPUT LOWER LEVEL to maximum counterclockwise. Observe that lower level goes more negative.

f. Rotate WIDTH vernier in a counterclockwise direction and verify that pulse width decreases.

g. Rotate WIDTH vernier to maximum clockwise position and verify that pulse width increases.

h. Complete pulse width and square wave check by performing steps indicated in Table 3-2.

*Same as above (paragraph 3.2.1).

3.2.3 Pulse Generator Delay Check

a. Set instrument controls as indicated in paragraph 3.2.2, step (b).

b. Rotate DELAY vernier in a clockwise direction to mid-point and verify that delay time increases (pulse moves to right).

c. Set PULSE MODE selector to DBL. Verify that two pulses per repetition rate period are displayed on oscilloscope. Rotate DELAY vernier in a counterclockwise direction and verify that the delay between pulses decreases (second pulse moves to left).

d. Return PULSE MODE selector to SGL.

e. Complete delay check by performing steps indicated in Table 3-3.

3.2.4 External Trigger/Drive Check

a. Set instrument controls as follows:

Control	Setting
CLOCK selector	EXT TRIG/-EXT DRIVE
DELAY selector	2 μs
DELAY vernier	maximum clockwise
WIDTH selector	2 μs
WIDTH vernier	mid-range
OUTPUT/LOWER LEVEL vernier	mid-range

Table 3-2. Width/Square Wave Check

Repetition Rate	Width Range	Oscilloscope Indication*	
		WIDTH Vernier maximum counterclockwise	WIDTH Vernier maximum clockwise
1 MHz	0.2 μs	<20 ns	>200 ns
100 kHz	2 μs	<200 ns	>2 μs
10 kHz	10 μs	<2 μs	>20 μs
1 kHz	0.2 ms	<20 μs	>200 μs
100 kHz	2 ms	<200 μs	>2 ms
20 Hz	20 ms	<2 ms	>20 ms
100 kHz	Sq Wave/Ext Dr	50% duty cycle	

* No provision is made for accuracy of range except the vernier will supply continuous overlap of ranges.

Table 3-3. Delay Check

Repetition Rate	Delay Range	Oscilloscope Indication*	
		DELAY Vernier maximum counterclockwise	DELAY Vernier maximum clockwise
1 MHz	0.2 μs	<20 ns	>200 ns
100 kHz	2 μs	<200 ns	>2 μs
10 kHz	20 μs	<2 μs	>20 μs
1 kHz	0.2 ms	<20 μs	>200 μs
100 Hz	2 ms	<200 μs	>2 ms
20 Hz	20 ms	<2 ms	>20 ms

* No provision is made for accuracy of range except the vernier will supply continuous overlap of ranges.

Control	Setting
OUTPUT/UPPER LEVEL vernier	maximum clockwise
PULSE MODE selector	DBL
OUTPUT selector	⎍

b. Connect external trigger source to EXT TRIG/DR connector. Set trigger source controls for output pulse at repetition rate of 100 kHz and +2 volt amplitude into 50 ohms.

c. Monitor OUTPUT (Z_O = 50 OHM) connector with real-time oscilloscope. Sync oscilloscope with >+2 V into 50 ohm output.

d. Insure that Versatester is triggered by verifying that 100 kHz, 2 μs pulse with delay of approximately 2 μs (from leading edge of first pulse to second) is present on oscilloscope display.

e. Set WIDTH selector to SQ WAVE (EXT DR).

f. Set PULSE MODE selector to SGL.

g. Set external trigger source controls for output pulse at repetition rate of 100 kHz, +2 V amplitude (into 50 ohms) and 4 μs pulse width.

h. Verify that output pulse characteristics (repetition rate and pulse width) reflect trigger source settings.

3.2.5 Single Cycle Check

a. Set instrument controls as follows:

Control	Setting
MEASUREMENT selector	CLK
CLOCK selector	EXT TRIG (EXT DR)
CLOCK vernier	maximum clockwise
WIDTH selector	20 MS
WIDTH vernier	maximum counterclockwise
MULTIMETER selector	AC

b. Depress MAN TRIG pushbutton and verify that one pulse appears (momentarily) on oscilloscope trace.

3.3 MULTIMETER

3.3.1 DMM Check

a. Set MEASUREMENT selector to DMM.

b. Set MULTIMETER RANGE selector to 5 and MODE selector to VAC.

c. Connect the $\sim$ output to the VAC/-CTR input. (Set CLOCK selector to 0.2 kHz.) Rotate SINE AMPLITUDE RMS vernier clockwise and observe that rms voltage level indicated on display increases.

d. Set MEASUREMENT selector to V_{LL}.

e. Rotate OUTPUT/LOWER LEVEL vernier to maximum counterclockwise and set OUTPUT/UPPER LEVEL to mid-point position and observe that display indicates negative voltage.

f. Set MEASUREMENT selector to V_{UL}.

g. Rotate OUTPUT/UPPER LEVEL vernier to maximum clockwise position and OUTPUT/LOWER LEVEL to mid-point and observe that display indicates positive voltage.

h. Set MEASUREMENT selector to V_{RMS}, rotate the SINE AMPLITUDE RMS vernier and observe that the amplitude is being internally measured.

3.3.2 DMM Resistance Measurement Check

a. Set MEASUREMENT selector to DMM.

b. Set MULTIMETER function selector to K OHM.

c. Connect indicated resistors between VDC/OHM and COM and set MULTIMETER (RANGE) selector to indicated position. Verify that proper test result indications appear on display. In each instance the test result should be the nominal resistance value plus the tolerance of the resistor.

MULTIMETER Selector	Test Resistance	Test Result
0.5	220 ohm	220 ohm ±tolerance
5	2.2 k ohm	2.2 k ohm ±tolerance
50	22 k ohm	22 k ohm ±tolerance
500	220 k ohm	220 k ohm ±tolerance
5 M OHM	2.2 megohm	2.2 megohm ±tolerance

3.4 POWER SUPPLY

a. Set MULTIMETER RANGE selector to 5, MODE to VDC and MEASUREMENT selector to DMM. Connect COM jack to GND jack.

b. Connect VDC/OHM jack to DC POWER +5 V jack and verify reading of +5 V ±2%.

c. Set RANGE selector to 50.

d. Connect VDC/OHM jack to DC POWER +15 V jack and connect COM jack to GND. Verify reading of +15 V ±2%.

e. Connect VDC/OHM jack to DC POWER -15 V jack. Verify reading of -15 V ±2%.

3.5 COUNTER

3.5.1 Counter Check (Internal)

a. Set instrument controls as follows:

Control	Setting
MEASUREMENT selector	CLK
CLOCK selector	2 MHz
CLOCK vernier	maximum clockwise
SINE AMPLITUDE RMS vernier	maximum clockwise

b. Observe display. It should be in excess of 2 MHz.

c. Rotate CLOCK vernier to maximum counterclockwise. Observe display. It should be 200 kHz or less.

3.5.2 Counter Total Check (External)

a. Set MEASUREMENT selector to CTR.

b. Set COUNTER SENSITIVITY control fully counterclockwise.

c. Connect Ω output to VAC/CTR input with coaxial cable terminated with a 50 ohm, 2 watt load.

d. Set MULTIMETER selector to VAC.

e. Set RANGE selector to 0.5.

f. Slowly turn COUNTER SENSITIVITY clockwise until counter triggers and observe display indication. It should be less than 200 kHz.

g. Set CLOCK selector to 0.2 kHz, vernier counterclockwise.

h. Set MEASUREMENT selector to TOTAL. Observe that display accumulates pulse count.

SECTION IV

CALIBRATION

4.1 EQUIPMENT REQUIRED

The following items of equipment (or their equivalent) are required to accomplish calibration of Versatester I.

a. Systron-Donner Model 6151 Counter.

b. Tektronix Model 485 Oscilloscope.

c. Systron-Donner Model 7004 Digital Multimeter.

d. James Bidel Resistance Standard (Catalog Number 601147-1).

e. Systron-Donner Model M106A DC Voltage Standard.

f. Hewlett-Packard Model 745A AC Voltage Standard.

g. Boonton Model 92C RF Millivolt Meter.

h. Systron-Donner BNC cable assemblies Part Number 36000 - 157.

i. Systron-Donner coaxial attenuator Model 442-20 dB.

NOTE: Allow a half-hour warm-up period with instrument covers on before proceeding with calibration. After each adjustment the top cover should be replaced.

4.1.1 Preliminary Control Positioning

Prior to performing calibration procedures, position the following controls to the indicated positions.

Control	Position
MULTIMETER RANGE	0.5
MULTIMETER MODE	VDC
CLOCK	any
DELAY	any
WIDTH	any
OUTPUT/UPPER LEVEL	any
OUTPUT/LOWER LEVEL	any
MEASUREMENT	DMM
COUNTER SENSITIVITY	maximum counterclockwise
PULSE MODE	any
OUTPUTS	any
POWER	ON
115/230 SLIDER SWITCH	appropriate position
DC POWER COMMON	connect to ground
DMM COMMON	connect to ground

4.2 POWER SUPPLY CALIBRATION

4.2.1 ±15 V (A) Internal (Chassis Ground)

The ±15 V (A) (internal) power supply is located on Assembly Number 37001-385, PCB Number 38000-494 at the rear of the unit.

a. Connect Model 7004 Digital Multimeter test probe to TP5B.

b. Adjust potentiometer R518 (V_{ADJ}) to obtain indication of -15 V ±10 mV.

c. Connect digital multimeter test probe to TP5A.

d. Adjust potentiometer R521 (BAL) to obtain indication of +15 V ±10 mV.

4.2.2 ±15 V (B) Internal (DMM Common)

The ±15 V (B) (internal, DMM common) power supply is located on Assembly Number 37001 - 399, PCB Number 38000 - 497 at the right of the unit.

a. Connect Model 7004 Digital Multimeter test probe to TP5J.

b. Rotate four turn potentiometer R598 (V_{ADJ}) to obtain indication of -15 V ±1 mV.

c. Connect digital multimeter test probe to TP5H.

d. Rotate four turn potentiometer R601 (BAL) to obtain indication of +15 V ±1 mV.

4.2.3 +5 V Internal (Chassis Ground)

The +5 V (internal) power supply is located on Assembly Number 37001 - 385, PCB Number 38000 - 494 at the rear of the unit.

a. Connect Model 7004 Digital Multimeter test probe to TP5C.

b. Adjust potentiometer R535 (+5 V ADJ) to obtain indication of +5 V ±10 mV.

4.2.4 +5 V External (Chassis Ground)

The +5 V (external) power supply is located on Assembly Number 37001 - 385, PCB Number 38000 - 494 at the rear of the unit.

a. Connect Model 7004 Digital Multimeter test probe to TP5F.

b. Adjust potentiometer R575 (+5 V ADJ) to obtain indication of +5 V ±10 mV.

4.2.5 ±15 V External (Floating Ground)

The ±15 V (external) power supply is located on Assembly Number 37001 - 385, PCB Number 38000 - 494 at the rear of the unit.

a. Connect Model 7004 Digital Multimeter test probe to TP5E.

b. Adjust potentiometer R558 (V_{ADJ}) to obtain indication of -15 V ±10 mV.

c. Connect digital multimeter test probe to TP5D.

d. Adjust potentiometer R561 (BAL) to obtain indication of +15 V ±10 mV.

4.3 COUNTER CALIBRATION

a. Connect Model 6151 Counter test probe to TP7A. Monitor counter clock frequency. It should be 1 MHz ±1 Hz. If it is not, adjust clock trimmer capacitor C712 to obtain this frequency.

b. Connect oscilloscope to TP7. Set MEASUREMENT selector to CLK, CLOCK selector to 2 kHz range, and CLOCK vernier maximum counterclockwise.

c. While observing waveshape, adjust R723 for a slight positive signal. The positive signal should have minimum width possible without allowing waveshape to go negative.

d. Set CLOCK selector to 0.2 kHz range and set vernier for reading of 20 Hz. If reading is not stable, repeat steps (c) and (d) until stable 20 Hz reading is obtained.

4.4 DMM CALIBRATION

Perform ±15 V supply (internal, DMM common) calibration as described in paragraph 4.2.2 before proceeding.

4.4.1 DC Volts

a. Short VDC/OHM terminal to COM terminal.

b. Set Versatester MULTIMETER RANGE selector to 0.5.

c. Set Versatester MULTIMETER MODE selector to VDC.

d. Set Versatester MEASUREMENT selector to DMM.

e. Connect Model 7004 Digital Multimeter test probe to TP10D. Adjust potentiometer R1066 for as close to zero millivolts as possible but no greater than ±1 mV. Adjust R1065 for 0 V ±0.1 mV.

f. Connect Voltage Standard Set to 0.5 V.

g. Adjust resistor R1071 for 5.000 V at TP10D.

h. Set standard to 0.05 V.

i. Set potentiometer R1082 fully counterclockwise.

j. Set potentiometer R1083 fully counterclockwise.

k. Connect digital multimeter test probe to TP10E and adjust potentiometer R1082 for 500 mV ±100 microvolts.

l. Reverse DC Voltage Standard terminal connections. Connect DC Voltage Standard (+) terminal to Versatester COM connector and DC Voltage Standard (-) terminal to VDC/OHM.

m. Connect digital multimeter test probe to TP10E, adjust potentiometer R1083 for +500 mV ±100 microvolts.

n. Reverse DC Voltage Standard connections so that Voltage Standard (+) terminal is connected to Versatester VDC/OHM and DC Voltage Standard (-) terminal is connected to COM.

o. Repeat step (l) to insure that step (n) did not effect adjustments performed in step (l).

p. Set standard to 0.0100 V. Observing Versatester display, adjust potentiometer R1112 for 0.0100. Indication must be exactly 0.0100. (NOTE: R1101 adjustment may affect this step).

q. Set DC Voltage Standard controls for 0.5000 V output.

r. Adjust potentiometer R1111 for 0.5000 V indication on Versatester display.

s. Repeat step (p) to insure that step (r) did not effect adjustment in step (p).

t. Set DC Voltage Standard controls for 0.5500 output.

u. Adjust potentiometer R1101 slowly until Versatester OVERRANGE indicator comes on, taking care not to rotate R1101 beyond the point at which indicator comes on.

v. Set DC Voltage Standard controls for 0.5000 output. Observe that Versatester OVERRANGE indicator extinguishes. If not, readjust potentiometer R1101 to the point where indicator extinguishes. Recheck steps (q) through (t) and re-perform steps as necessary.

w. Disconnect DC Voltage Standard from Versatester.

4.4.2 Ohms

a. Connect Resistance Standard between Versatester COM and VDC/-OHM connectors. Set Resistance Standard controls for 0.5000 k ohms.

b. Set Versatester MULTIMETER MODE selector to k ohms.

c. Connect digital multimeter test probe to TP10C. Adjust potentiometer R1052 for 5.000 V.

d. Observing Versatester display, adjust potentiometer R1259 for 0.5000 k ohms indication on Versatester display.

e. Set Versatester MULTIMETER RANGE selector to 5.

f. Set Resistance Standard controls to 5.000 k ohms.

g. Adjust potentiometer R1257 for 5.000 k ohms indication on Versatester display.

h. Set Versatester MULTIMETER RANGE selector to 50.

i. Set Resistance Standard controls for 50.00 k ohms.

j. Adjust potentiometer R1255 for 50.00 k ohm indication on display.

k. Set Versatester MULTIMETER RANGE selector to 500.

l. Set Resistance Standard controls for 500.0 k ohms.

m. Adjust potentiometer R1253 for 500.0 k ohm indication on Versatester display.

n. Set Versatester MULTIMETER RANGE selector to 5 M OHM.

o. Set Resistance Standard controls for 1.000 megohm.

p. Adjust potentiometer R1261 for 1.000 megohm indication on display.

q. Disconnect Resistance Standard from Versatester.

4.4.3 Multimeter Final Adjustments

a. Set mode selector to VDC. Set MULTIMETER RANGE selector of Versatester to 500. Connect DC Voltage Standard. Set standard to 500 V.

b. Retouch R1259 slightly if reading is not 500 V +0.4 V.

c. Set DC Voltage Standard to 50.00 V and MULTIMETER RANGE selector to 50.

d. Retouch R1257 slightly if reading is not 50.00 V ±0.04 V.

e. Repeat steps (a) through (d) as necessary to obtain stated tolerances on both 500 and 50 ranges.

f. Set DC Voltage Standard to 5.000 V and MULTIMETER RANGE selector to 5.

g. Retouch R1255 slightly if reading is not 5.000 V ±0.004 V.

h. Check steps (a) through (g) for stated tolerances and repeat adjustments if necessary.

i. Check ohm ranges. If all ranges are out of tolerance by (approximately) same percentage, readjust R1052 to obtain proper ohm readings. If one range only is out, steps (a) through (g) have not been performed properly and should be rechecked.

4.4.4 AC Volts

a. Set AC Voltage Standard controls for 0.5000 (rms), 1 kHz input to Versatester.

b. Connect AC Voltage Standard (AC) to Versatester VAC/CTR connector.

c. Set Versatester MULTIMETER RANGE selector to 0.5.

d. Set Versatester MULTIMETER MODE selector to VAC.

e. Turn Versatester SENSITIVITY control fully counterclockwise.

f. Adjust potentiometer R1024 for 0.5000 V (rms) indication on Versatester display.

g. Set AC Voltage Standard controls for 0.0500 V (rms).

h. Adjust potentiometer R1021 for 0.0500 V (rms) indication on display.

i. Set Versatester MULTIMETER RANGE selector to 5.

j. Set AC Voltage Standard to 5.000 V (rms).

k. Set AC Voltage Standard controls for 100 kHz output, or highest available frequency from AC standard being used.

l. Adjust C1251/C1252 for 5.000 V indication on display.

m. Set Versatester MULTIMETER RANGE selector to 50.

n. Set Voltage Standard controls for 50.00 V output at 100 kHz, or highest available frequency from AC standard being used.

4.5 WIEN BRIDGE OSCILLATOR CALIBRATION

a. Set CLOCK selector to 0.2 MHz range.

b. Set Z_O = 50 OHM/Z_O = 600 OHM selector to Z_O = 50 OHM.

c. Set SINE AMPLITUDE to maximum counterclockwise.

d. Connect test cable from output to RF millivolt meter. Be sure that meter has 50 ohm adapter connected. Set meter to its 3000 mV scale.

e. Set R32 fully counterclockwise and then turn SINE AMPLITUDE control fully clockwise. Be sure to set R32 counterclockwise first to keep from pinning meter and possibly causing damage.

f. Adjust R32 for reading of 3.1 volts rms on RF millivolt meter.

g. Turn SINE AMPLITUDE control clockwise until meter reads 0 on dB scale (approximately 2.2 volts rms).

h. Rotate CLOCK vernier from maximum counterclockwise position to the maximum clockwise position. If signal amplitude varies more than +0.25 dB from maximum counterclockwise to maximum clockwise, adjust capacitor C6 to maintain ±0.25 dB tolerance.

i. Set CLOCK selector to 20 MHz and MEASUREMENT selector to CLK. Rotate CLOCK vernier to maximum clockwise.

j. Adjust C4 to obtain frequency between 20.5 and 21.0 MHz.

k. Rotate CLOCK vernier to maximum counterclockwise. Check that frequency is less than 2.0 MHz. If not, readjust C4 until it is and recheck step (j).

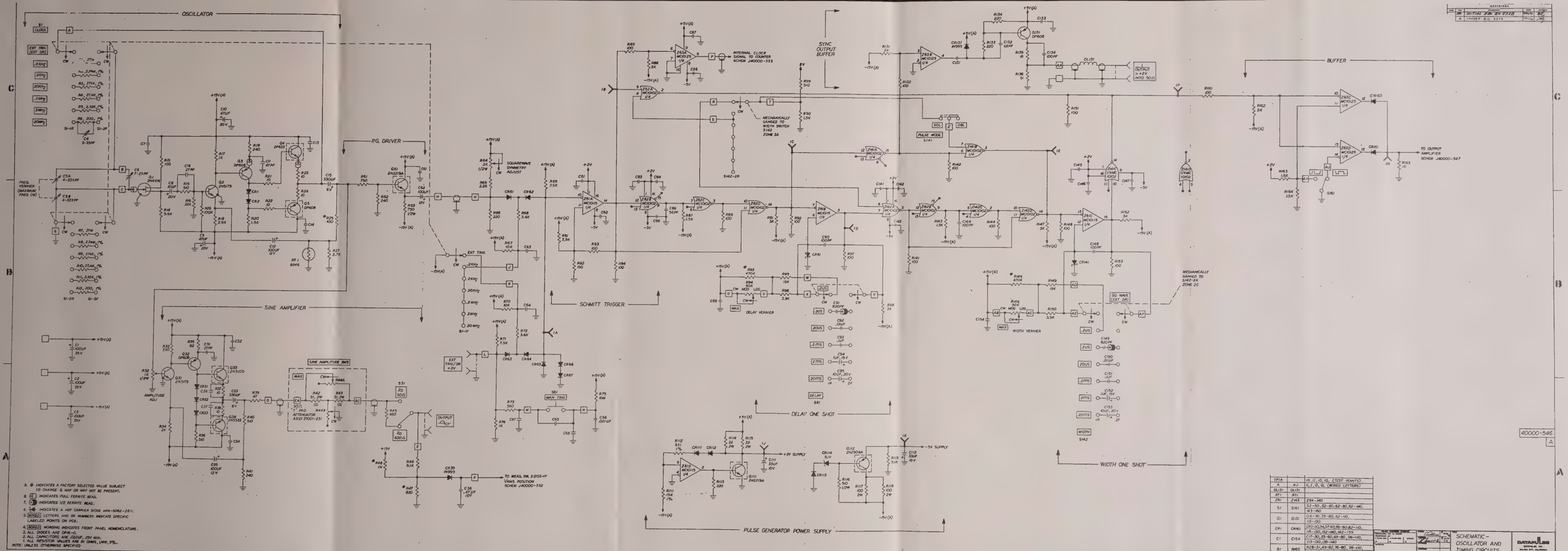
l. Repeat steps (j) and (k) as necessary to obtain variation from maximum counterclockwise to maximum clockwise of from < 2.0 MHz to > 20.0 MHz respectively.

4.6 SQUARE WAVE SYMMETRY CALIBRATION

a. Connect oscilloscope to test point TP10.

b. Set WIDTH selector to SQ WAVE (EXT DR) position.

c. Set CLOCK selector to 20 kHz and while observing oscilloscope, adjust potentiometer R64 for symmetrical positive and negative durations of the waveshape.



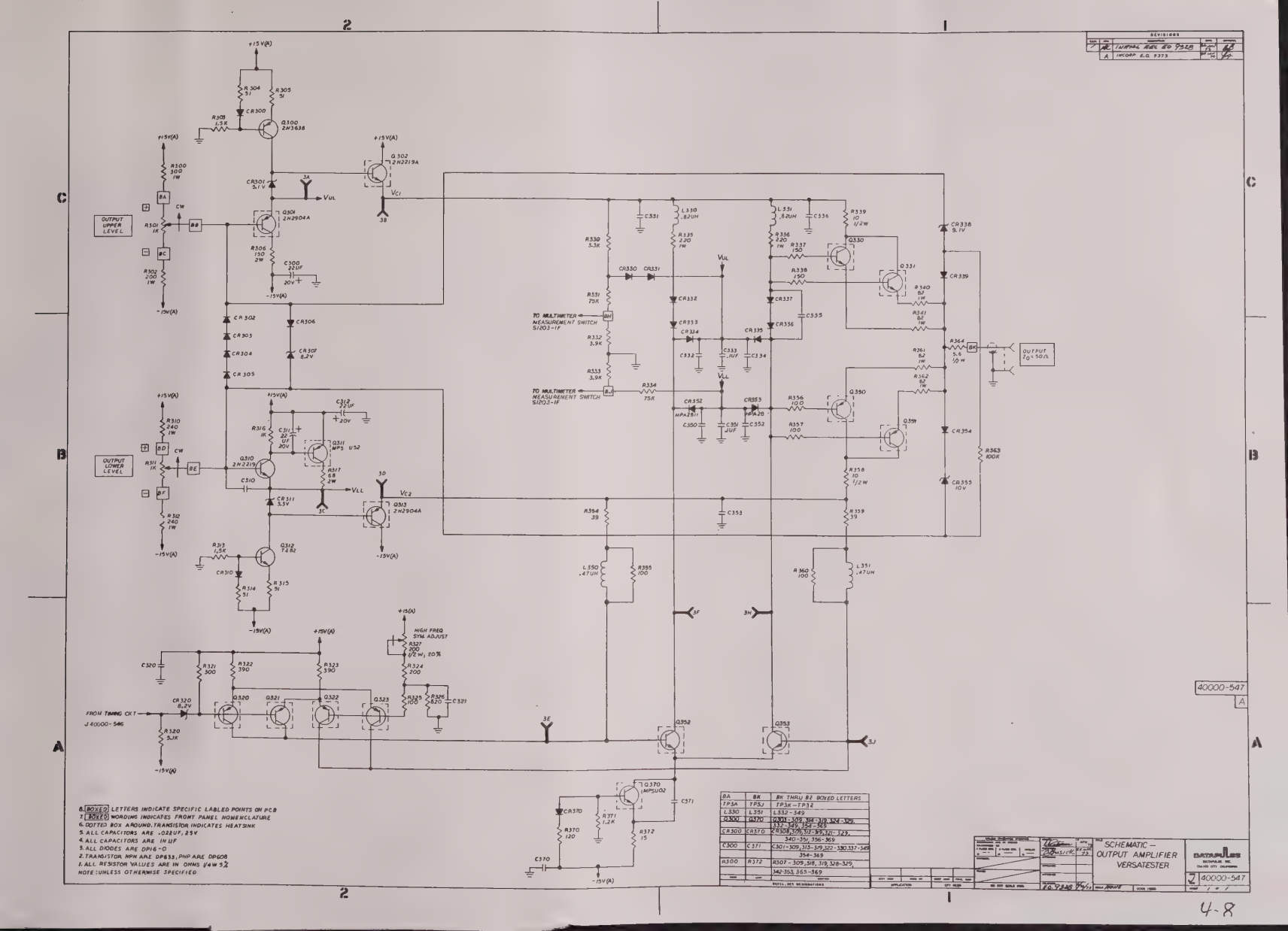
TP/A		
A	A2	10.11, 10, 10, (TEST POINTS)
DL131	DL131	G, I, O, Q, (BOARD LETTERS)
RT1	RT1	
ZB1	Z43	Z84-140
S1	S141	S2-50, S2-60, S2-80, S2-140, S43-160
Q1	Q131	(1.5-30, 35-60, 62-110, 113-130
CR1	CR141	CR1-30, 34, 37-60, 88-80, 82-110, 175-150, 152-140, 142-159
C1	C154	(C1-30, 33-60, 63-80, 96-110, 113-130, 138-140
R1	R165	R28-31, 49-60, 76-80, 99-110, 120-130, 137-140, 156-160

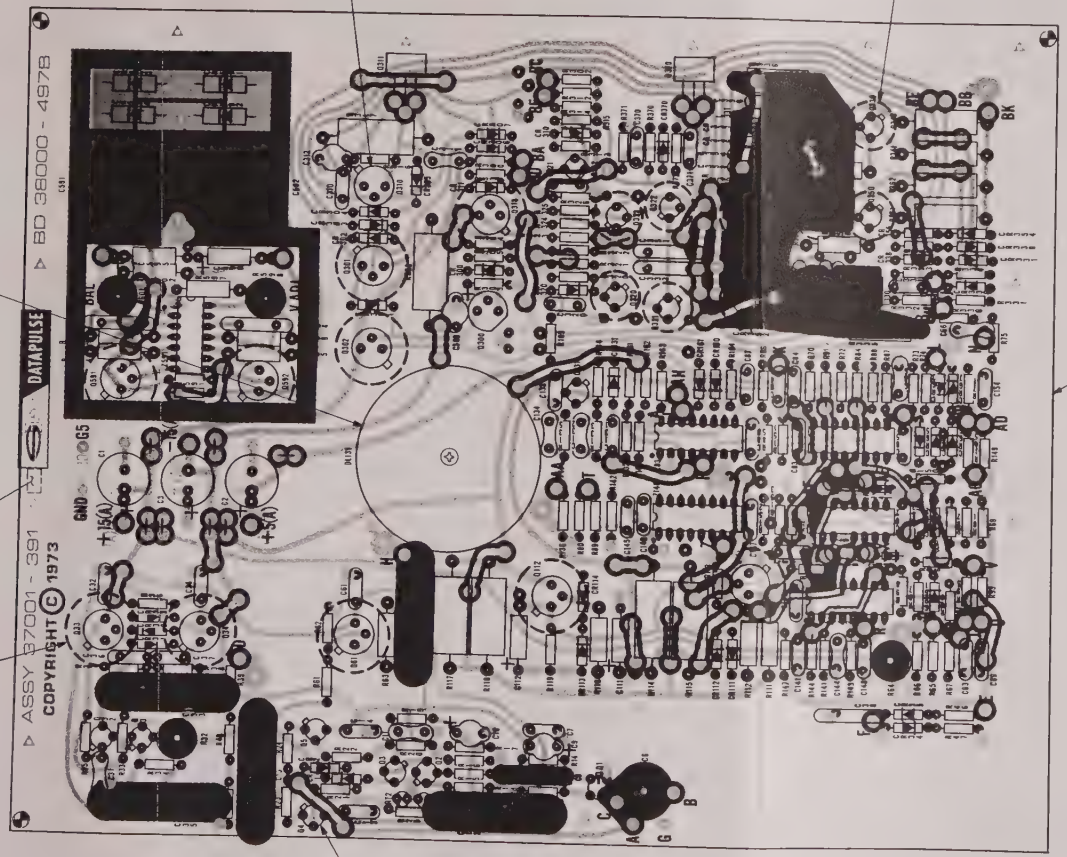
		SCHEMATIC - OSCILLATOR AND TIMING CIRCUITS VERSATESTER

DATAPULSE INCORPORATED, 460 SIERRA MADRE VILLA, PASADENA, CALIFORNIA

40000-546 A

4-7


+15V(A)
R304 51
R305 51
CR300
R308 1.5K
Q300 2N3638
R300 300 1W
BA
CW
OUTPUT UPPER LEVEL
R301 1K
BB
BC
R302 200 1W
-15V(A)
CR301 5.1V
3A
VUL
Q302 2N2219A
Vc1
3B
Q301 2N2904A
R306 150 2W
C300 22UF 20V
CR302
CR303
CR304
CR305
CR306
CR307 8.2V
C312 22UF 20V
R316 1K
C311 22 UF 20V
Q311 MPS U52
R317 68 2W
OUTPUT LOWER LEVEL
R311 1K
BD
BE
BF
R310 240 1W
R309 240 1W
C310
3C
VLL
3D
Vc2
Q313 2N2904A
CR311 5.1V
R313 1.5K
Q312 T482
CR310
R314 51
R315 51
HIGH FREQ SYM. ADJUST
R327 200 (1/2 W) 20%
R324 700
R323 390
R322 390
R321 300
C320
CR320 8.2V
FROM TIMING CKT J 40000-546
R320 5.1K
Q320
Q321
Q322
Q323
R325 100
R326 820
C321
C330 .82UH
R330 5.3K
R335 220 1W
C331
CR330
CR331
CR332
CR333
CR334
CR335
R331 75K
R332 5.9K
R333 5.9K
TO MULTIMETER MEASUREMENT SWITCH S1203-1F
R334 75K
CR352 HPA2811
CR353 HPA2811
C350
C351 .01UF
C352
C332
C333 .01UF
C334
VLL
L331 .82UH
C336
R339 10 1/2W
R336 220 1W
R337 150
R338 150
Q330
Q331
CR337
C335
CR336
CR338 9.1V
CR339
R340 82 1W
R341 82 1W
R361 82 1W
R362 82 1W
R364 5.6 1/2 W
OUTPUT Io=50A
Q350
Q351
R356 100
R357 100
CR354
CR355 10V
R358 10 1/2 W
R363 100K
R354 39
C353
R359 39
L350 .47UH
R355 100
R360 100
L351 .47UH
3F
3H
3E
3J
Q352
Q353
Q370 IMPSU02
C371
CR370
R371 1.2K
R370 120
R372 15
C370
-15V(A)
6. BOXED LETTERS INDICATE SPECIFIC LABLED POINTS ON PCB
7. BOXED WORDING INDICATES FRONT PANEL NOMENCLATURE
6. DOTTED BOX AROUND TRANSISTOR INDICATES HEATSINK
5. ALL CAPACITORS ARE .022UF, 25V
4. ALL CAPACITORS ARE IN UF
3. ALL DIODES ARE DP16-0
2. TRANSISTOR MPN ARE DP633, PNP ARE DP608
1. ALL RESISTOR VALUES ARE IN OHMS 1/4W 5%
NOTE: UNLESS OTHERWISE SPECIFIED
BA BK BK THRU BJ BOXED LETTERS
TP3A TP3J TP3K-TP32
L330 L351 L332-349
A300 A370 Q301-309, 314-318, 324-329, 332-349, 354-369
CR300 CR370 CR308, 309, 312-319, 321-323, 340-344, 354-369
C300 C371 C301-309, 313-319, 322-330, 337-349, 354-369
A300 R372 R307-309, 318, 319, 328-329, 342-353, 363-369
SCHEMATIC — OUTPUT AMPLIFIER VERSATESTER
DATAPULSE INCORPORATED OLIVED CITY CALIFORNIA
40000-547
A
4-8



REVISIONS			
DWR	DESCRIPTION	DATE	APPROVAL
N/C	INITIAL REL EO 9328	26 JUN '73	

37001-391

SEE SEPARATE PARTS LIST-"A" SIZE SH. 2 THRU 10 OF THIS DWG

ARK ASSY REV LTR IN LOCATION SHOWN, COLOR WHITE
FERENCE SCHEMATIC DWG NO. J40000-546 & -547
SS OTHERWISE SPECIFIED"

37001-410	V-I	1	1
NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
3 PLACE DEC. ± | 2 PLACE DEC. ± | ANGLES ±
MATERIAL
Finish
DO NOT SCALE DWG.

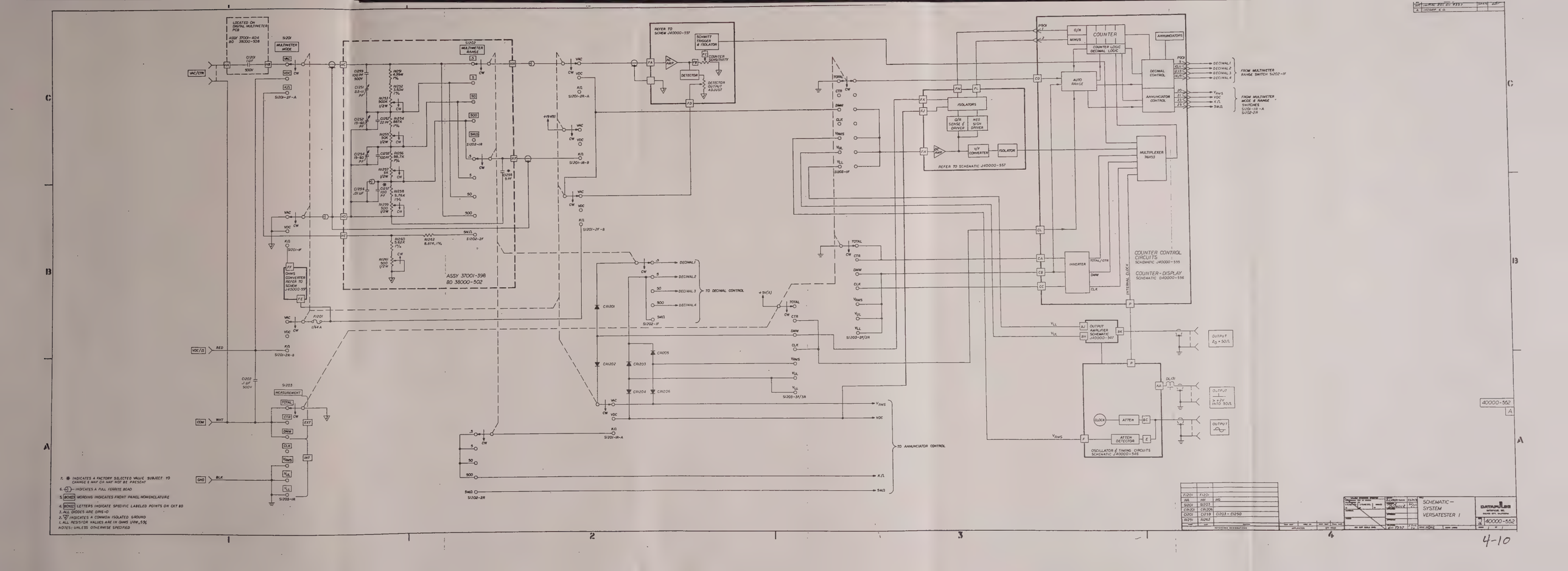
DRAWN: Zuckerman 26 JUN 73
CHECKED: Blumrick 26 JUN 73
APPROVED
APPROVED
APPROVED
RELEASED: EO 9328 26 JUN 73

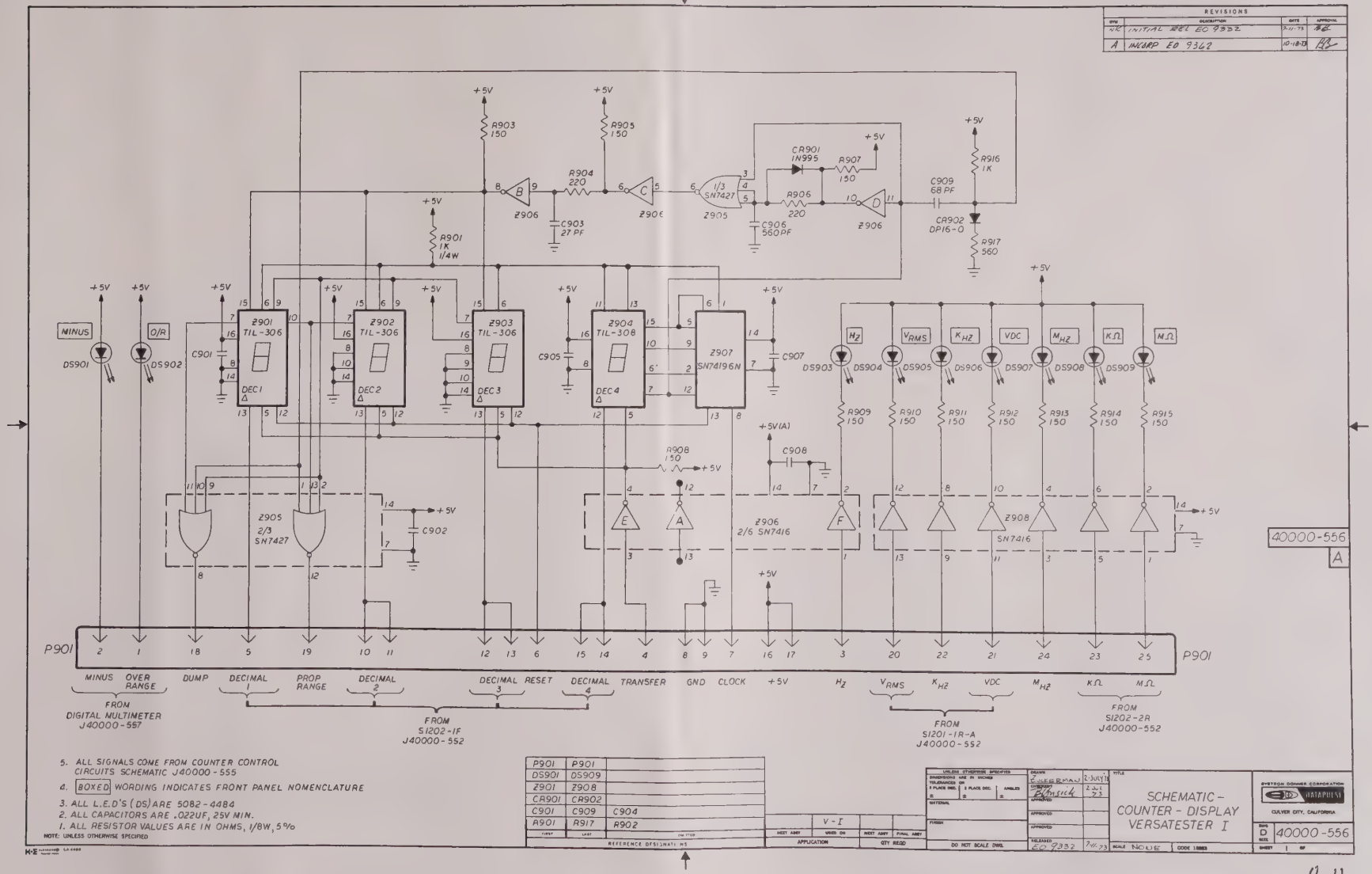
TITLE: CIRCUIT BOARD - ASSEMBLY PULSE GENERATOR VERSATESTER I

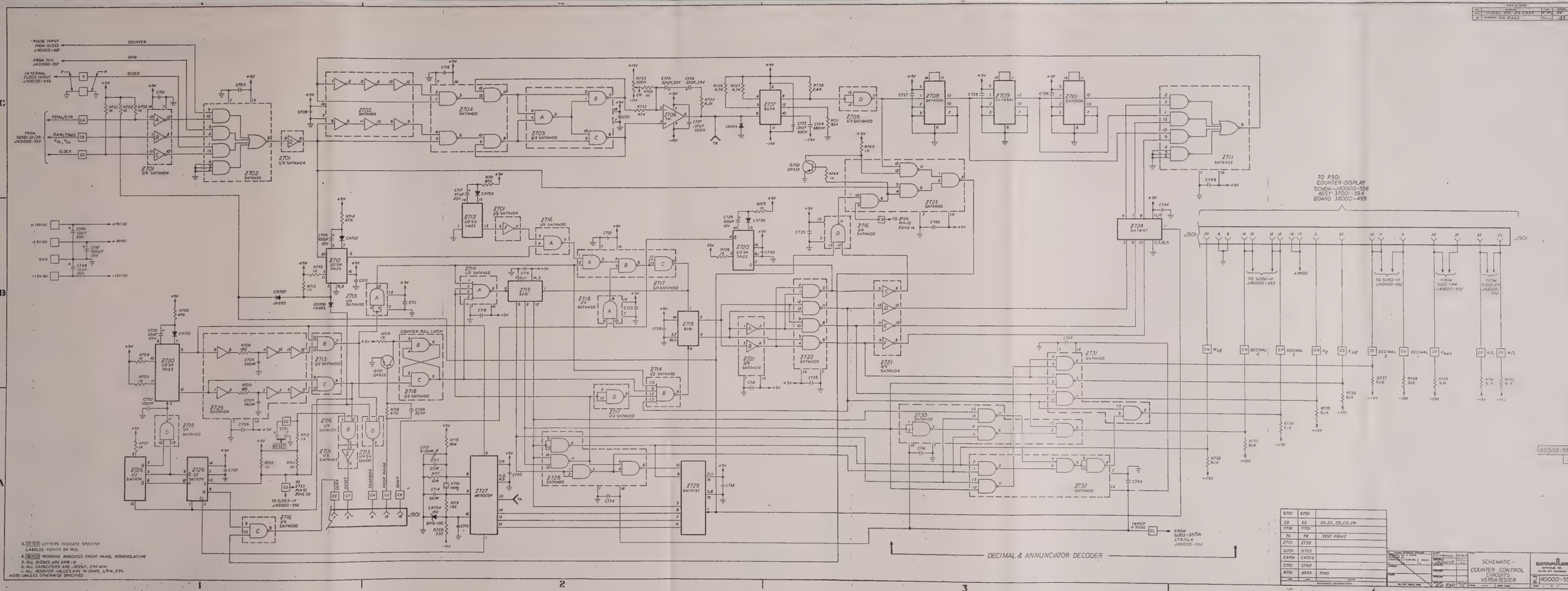
SCALE 2/1 | CODE 19933

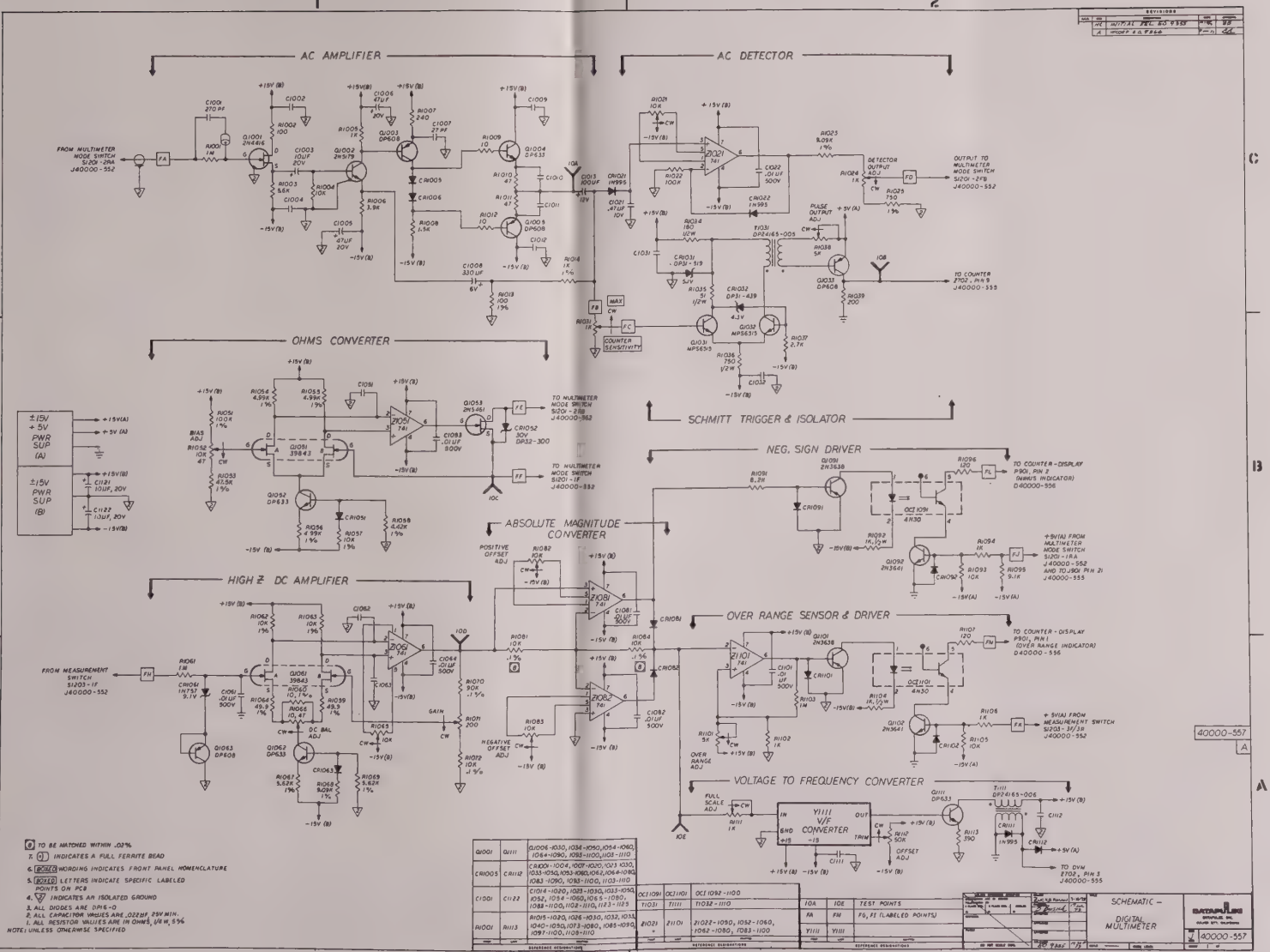
SYNTRON DONNER CORPORATION
DATAPULSE
CULVER CITY, CALIFORNIA

DWG NO. 37001-391
SIZE D
SHEET 1 OF


LOCATED ON DIGITAL MULTIMETER PCB
ASSY 37001-404
BD 38000-508
S1201 MULTIMETER MODE
S1202 MULTIMETER RANGE
VAC/CTR
VAC
VDC
Ω
CW
C1201 1 UF 500V
K1 S1201-2F-A
R1251 900K 1/2W
R1252 9.63K 1%
R1253 90K 1/2W
R1254 887K 1%
R1255 8.87K 1%
R1256 88.7K 1%
R1257 1K 1/2W
R1258 9.76K 1%
R1259 100 1/2W
R1260 9.52Ω 1%
R1261 900 1/2W
R1262 8.87K 1%
C1251 2.5-11 PF
C1252 15-60 PF
C1253 22 PF
C1254 15-60 PF
C1255 100PF
C1256 100PF
C1257 .01 UF
C1258 5 PF
C1259 100 PF 500V
5W/Ω S1202-1R
5W/Ω S1202-2F
ASSY 37001-398
BD 38000-502
OHMS CONVERTER REFER TO SCHEM J40300-557
F1201 1/64 A
VDC/Ω
RED
K1 S1201-2R-B
C1202 1 UF 500V
S1203 MEASUREMENT
TOTAL
CTR
EXT
DMM
CLK
VRMS
INT
VLL
COM
WHT
GND
BLK
S1202-1R
REFER TO SCHEM J40000-557
SCHMITT TRIGGER & ISOLATOR
COUNTER SENSITIVITY
DETECTOR
DETECTOR OUTPUT ADJUST
K1 S1201-2R-A
+5V(B)
K1 S1201-1F
K1 S1201-2F-B
K1 S1201-1R-B
K1 S1201-1R-A
DECIMAL1
DECIMAL2
DECIMAL3
DECIMAL4
TO DECIMAL CONTROL
S1202-1F
CR1201
CR1202
CR1203
CR1204
CR1205
CR1206
+5V(A)
S1203-2F/2R
S1203-3F/3R
TO ANNUNCIATOR CONTROL
K1
5W/Ω
P900
Q/R
MINUS
COUNTER
COUNTER LOGIC DECIMAL LOGIC
ANNUNCIATORS
AUTO RANGE
DECIMAL CONTROL
ANNUNCIATOR CONTROL
FROM MULTIMETER RANGE SWITCH S1202-1F
FROM MULTIMETER MODE & RANGE SWITCHES S1201-1R-A S1202-2R
ISOLATORS
Q/R SENSE & DRIVER
MED S/SW DRIVER
V/F CONVERTER
ISOLATOR
MULTIPLEXER 74H53
REFER TO SCHEMATIC J40000-557
TOTAL/CTR
DMM
CLK
INVERTER
INTERNAL CLOCK
COUNTER CONTROL CIRCUITS
SCHEMATIC J40000-555
COUNTER-DISPLAY
SCHEMATIC D40200-556
OUTPUT AMPLIFIER SCHEMATIC J40000-547
OUTPUT Zo = 50Ω
OUTPUT > +2V INTO 50Ω
OUTPUT
CLOCK
ATTEN
ATTEN DETECTOR
OSCILLATOR & TIMING CIRCUITS SCHEMATIC J40000-546
1. ⊛ INDICATES A FACTORY SELECTED VALUE, SUBJECT TO CHANGE & MAY OR MAY NOT BE PRESENT
4. INDICATES A FULL FERRITE BEAD
5. BOARD WORDING INDICATES FRONT PANEL NOMENCLATURE
6. BOARD LETTERS INDICATE SPECIFIC LABELED POINTS ON CKT BD
3. ALL DIODES ARE DR8-0
2. INDICATES A COMMON ISOLATED GROUND
1. ALL RESISTOR VALUES ARE IN OHMS 1/8W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED
F1201 F1201
WA MF JG
S1202 S1203
CR1201 CR1206
C1201 C1259 C1253 - C1250
R1275 R1262
REFERENCE DESIGNATIONS
SCHEMATIC — SYSTEM VERSATESTER I
DATAMETRICS
WILMINGTON, MA
SANTA ANA, CALIFORNIA
40000-552
A
4-10


REVISIONS
NK INITIAL REL EO 9332 2-1-73
A INCORP EO 9362 10-18-73
+5V
R903 150
R905 150
R904 220
R901 1K 1/4W
R916 1K
R917 560
CR901 IN995
R907 150
R906 220
CR902 OP16-O
C909 68 PF
C903 27 PF
C906 560 PF
Z906
Z905
1/3 SN7427
MINUS
O/R
DS901
DS902
Z901 TIL-306
Z902 TIL-306
Z903 TIL-306
Z904 TIL-308
Z907 SN74196N
DEC1
DEC2
DEC3
DEC4
C901
C905
C907
Hz
VRMS
KHZ
VDC
MHZ
KΩ
MΩ
DS903
DS904
DS905
DS906
DS907
DS908
DS909
R909 150
R910 150
R911 150
R912 150
R913 150
R914 150
R915 150
R908 150
C908
+5V(A)
Z905 2/3 SN7427
C902
Z906 2/6 SN7416
Z908 SN7416
P901
MINUS
OVER RANGE
DUMP
DECIMAL 1
PROP RANGE
DECIMAL 2
DECIMAL 3
RESET
DECIMAL 4
TRANSFER
GND
CLOCK
FROM DIGITAL MULTIMETER J40000-557
FROM S1202-1F J40000-552
FROM S1201-1R-A J40000-552
FROM S1202-2R J40000-552
40000-556
A
5. ALL SIGNALS COME FROM COUNTER CONTROL CIRCUITS SCHEMATIC J40000-555
4. BOXED WORDING INDICATES FRONT PANEL NOMENCLATURE
3. ALL L.E.D'S (DS) ARE 5082-4484
2. ALL CAPACITORS ARE .022UF, 25V MIN.
1. ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 5%
NOTE: UNLESS OTHERWISE SPECIFIED
P901 P901
DS901 DS909
Z901 Z908
CR901 CR902
C901 C909 C904
A901 R917 R902
REFERENCE DESIGNATIONS
V-I
APPLICATION
CITY REQD
DRAWN K.EBERMAN 2-JULY-73
CHECKED B.Finnick 2 JUL 73
APPROVED
APPROVED
RELEASED EO 9332 7-11-73
SCALE NONE
TITLE
SCHEMATIC - COUNTER - DISPLAY VERSATESTER I
SYSTRON DONNER CORPORATION
DATAPULSE
CULVER CITY, CALIFORNIA
SIZE D
40000-556
SHEET 1 OF


DECIMAL & ANNUNCIATOR DECODER
TO P901 COUNTER-DISPLAY SCHEM-140000-556 ASSY-37001-394 BOARD 38000-499
SCHEMATIC - COUNTER CONTROL CIRCUITS VERSATESTER
140000-555
4-12


AC AMPLIFIER
AC DETECTOR
OHMS CONVERTER
SCHMITT TRIGGER & ISOLATOR
NEG. SIGN DRIVER
ABSOLUTE MAGNITUDE CONVERTER
HIGH Z DC AMPLIFIER
OVER RANGE SENSOR & DRIVER
VOLTAGE TO FREQUENCY CONVERTER
FROM MULTIMETER MODE SWITCH S1201-2FA J40000-552
TO MULTIMETER MODE SWITCH S1201-2FB J40000-552
TO COUNTER Z702, PIN 9 J40000-555
TO MULTIMETER MODE SWITCH S1201-1F J40000-552
TO MULTIMETER MODE SWITCH S1201-2EB J40000-552
FROM MEASUREMENT SWITCH S1203-1F J40000-552
TO COUNTER - DISPLAY P901, PIN 2 (MINUS INDICATOR) D40000-556
TO COUNTER - DISPLAY P901, PIN 1 (OVER RANGE INDICATOR) D40000-556
+5V(A) FROM MULTIMETER MODE SWITCH S1201-1FA J40000-552 AND TO J901 PIN 21 J40000-555
+5V(A) FROM MEASUREMENT SWITCH S1203-3F/3B J40000-552
TO DVM Z702, PIN 3 J40000-555
±15V +5V PWR SUP (A)
±15V PWR SUP (B)
40000-557
A

Q1001	Q1111
CR1005	CR1112
C1001	C1122
R1001	R1113

OC1091	OC1101
T1031	T1111
Z1021	Z1101

Q1006-1030, 1034-1050, 1054-1060, 1064-1090, 1093-1100, 1103-1110	
CR1009-1004, 1007-1020, 1023-1030, 1033-1050, 1053-1060, 1062, 1064-1080, 1083-1090, 1093-1100, 1103-1110	
C1004-1020, 1023-1030, 1033-1050, 1052, 1054-1060, 1065-1080, 1084-1100, 1102-1110, 1123-1125	
R1015-1020, 1026-1030, 1032, 1034, 1040-1050, 1073-1080, 1085-1090, 1097-1100, 1108-1110	

Z1022-1050, 1052-1060, 1062-1080, 1083-1100	
T1032-1110	
OC1092-1100	

10A	10E	TEST POINTS
FA	FN	F6, F1 (LABELED POINTS)
Y1111	Y1111	

SCHEMATIC — DIGITAL MULTIMETER

DATAPULSE INCORPORATED

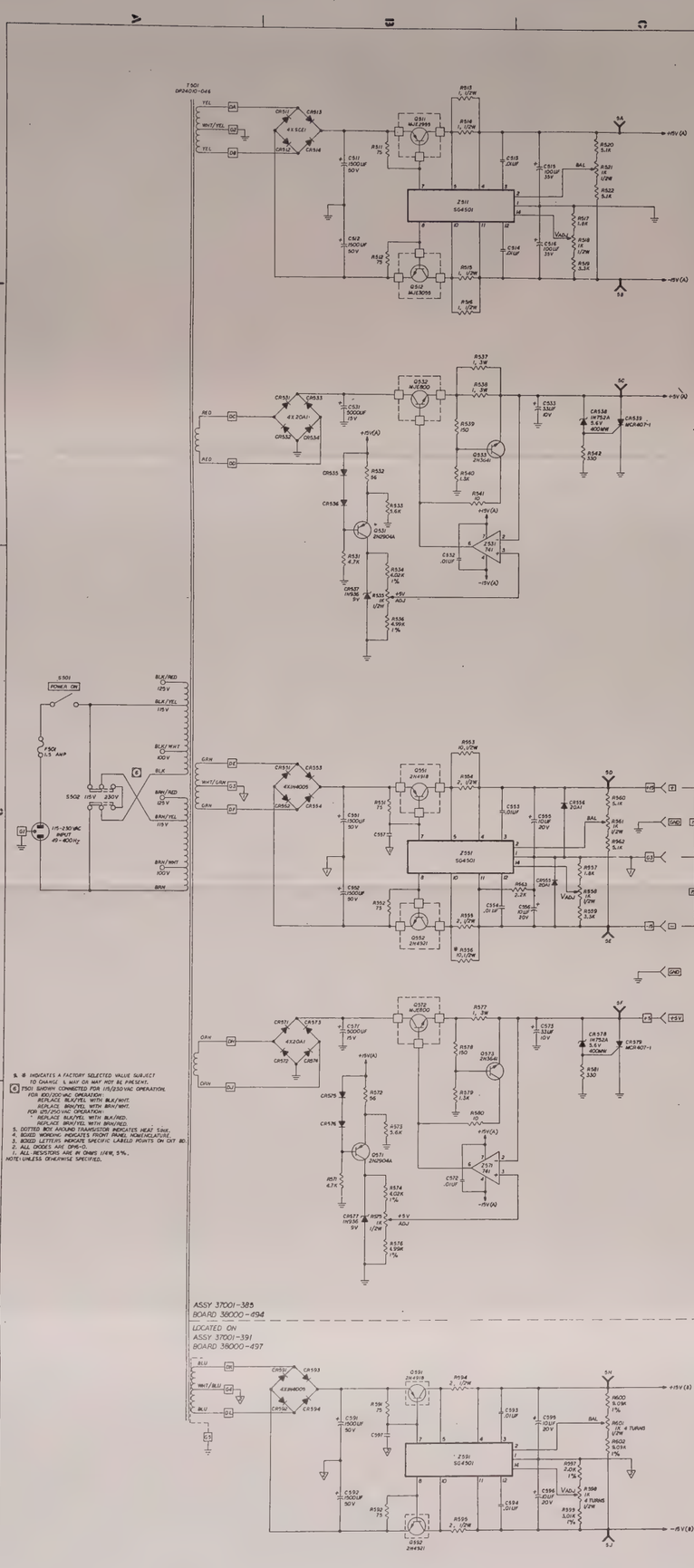
40000-557

4-13

0. TO BE MATCHED WITHIN .02%
1. (F) INDICATES A FULL FERRITE BEAD
6. BOXED WORDING INDICATES FRONT PANEL NOMENCLATURE
5. BOXED LETTERS INDICATE SPECIFIC LABELED POINTS ON PCB
4. INDICATES AN ISOLATED GROUND
3. ALL DIODES ARE DP16-0
2. ALL CAPACITOR VALUES ARE .022μF, 25V MIN.
1. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%
NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
SEE SHEET 1			

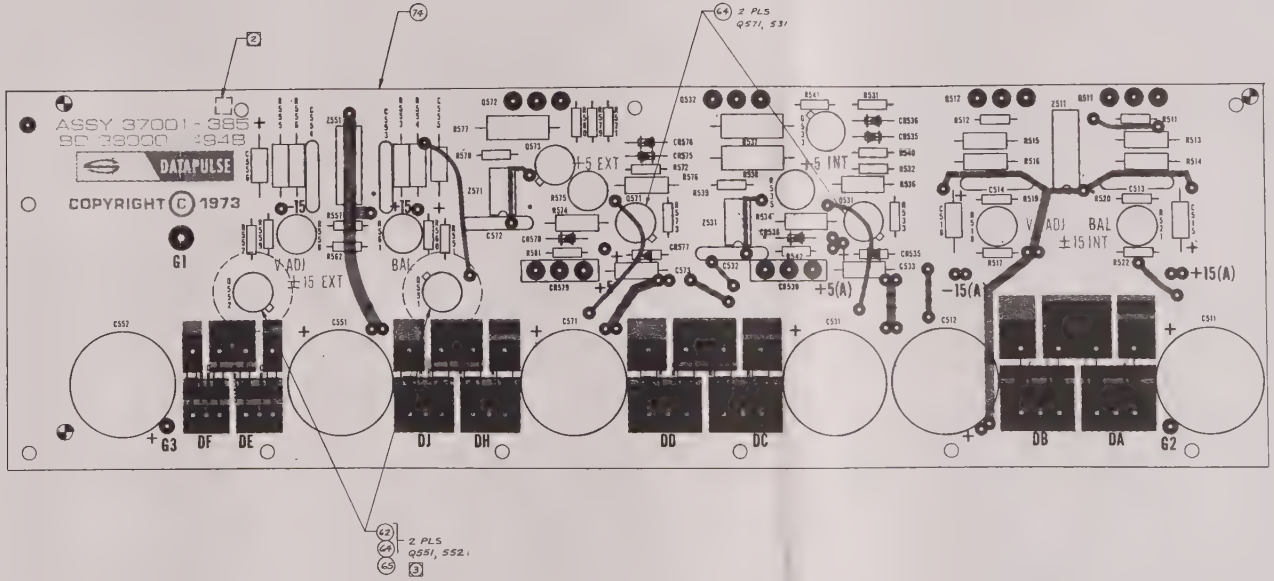
UNLESS OTHERWISE SPECIFIED				DRAWN	W&M	1 AUG 73	TITLE	DATAPULSE
DIMENSIONS ARE IN INCHES				CHECKED			ARTWORK - P.C.B.	DATAPULSE, INC.
TOLERANCES ON				APPROVED			COUNTER & MULTIMETER	CULVER CITY, CALIFORNIA
X PLACE DEC. ±	XX PLACE DEC. ±	ANGLES ±		APPROVED			VERSATESTER I	SIZE D
MATERIAL				APPROVED			COMPONENT OUTLINE	DWG NO. 50000-738
FINISH				RELEASED			SCALE 2:1	CODE 15933
DO NOT SCALE DWG.								SHEET 3 OF



REVISIONS
LTR
DESCRIPTION
DATE
APPROVED

POWER SUPPLY
SCHEMATIC
38000-494
SHEET 2 OF 2

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
N/C	INITIAL RELEASE E.O. 9317	25 MAY 73	dd



37001-385

37001-385

APPLY THERMAL COMPOUND (ITEM 45) TO Q551 & Q552 BEFORE MOUNTING HEAT SINKS.

MARK ASSY REV LTR IN LOCATION SHOWN, COLOR WHITE.

- REFERENCE SCHEMATIC DWG NO. J40000-548.

NOTE UNLESS OTHERWISE SPECIFIED

SEE SEPARATE PARTS LIST-"A" SIZE SH. 2 THRU 5 OF THIS DWG

37001-410	VT-I	1	1
NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

DO NOT SCALE DWG.

DRAWN	WBM	23 MAY 73
CHECKED	Basick	23 MAY 73
APPROVED		
APPROVED		
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RELEASED	E.O. 9317	25 MAY 73

TITLE: CIRCUIT BOARD - ASSEMBLY POWER SUPPLY VERSATESTER

SCALE 2/1 | CODE 19833

DYNATRON DONNER CORPORATION — DATAPULSE — CULVER CITY, CALIFORNIA

SIZE D | 37001-385

SHEET 1 OF 5

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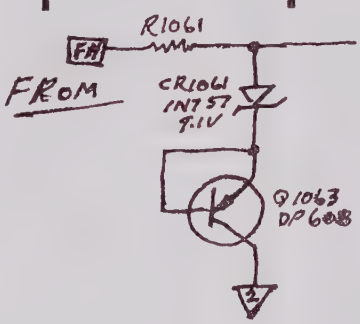
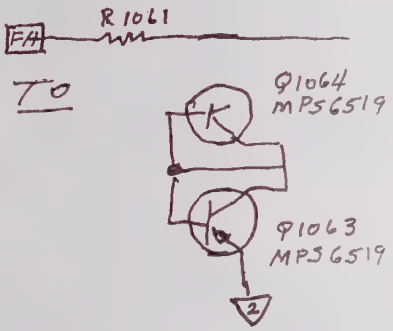
4-16

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
4594	11-15-73	40000-557	Change CR1061, 1N757, 9.1 V to Q1064, MPS6519, P/N12605-018 per the following drawing.





Change Q1064 from DP608 to MPS6519 P/N12605-018.
Change Q1061 from 39843 to SU2365A, P/N12735-000.
Change R1067 from 5.62 k to 10 k, P/N10710-103.
Break connection between FB and junction of R1014, C1013 and CR1021.
Add 390 ohm between FB and junction of R1014, C1013 and CR1021.
Add 100 ohm from FB to ground.
Break connection between R1035 and junction of CR1031, R1034 and T1031.
Connect R1035 to +15 V.
Change R1035 from 50 ohm to 680 ohm, P/N10011-681.
Change R1036 from 750 ohm to 1.5 k, P/N10011-152.
Change R1037 from 2.7 k to 1.8 k, P/N10010-182.
Add 51 ohm from base of Q1032 to ground, P/N10010-510.

4597	11-19-73	4000-557	Change C1007 from 27 pF, P/N11077-270 to 47 pF, P/N11077-470.
4611	11-30-73	40000-555	Change C709 and C729 from 10 V to 15 V and change C747 from 35 V to 15 V, P/N11169-107.
4615	12-9-73	40000-556	Change R901 to delete 1/4 W and R916 to add 1/4 W.
4628	12-21-73	40000-557	Change R1036 from 1.5 k, P/N10011-152 to 1.2 k, P/N10011-122.

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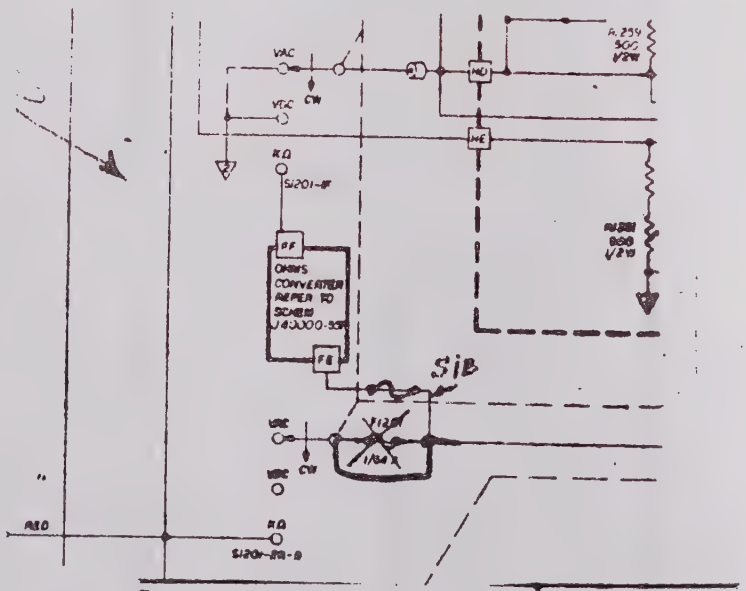
4628 (cont.			Change R1037 from 1.8 k, P/N10010-182 to 1.3 k, P/N10010-132. Change 51 ohm, P/N10010-510 between base of Q1032 and ground to 33 ohm, P/N10010-330. Add asterisk's to all components.
4631	1-4-74	40000-555	Change Black/White wire between P901 pins 7 and 8 (ground) and Z716, pin 8 and ground to coaxial cable, P/N17090-003, shield to ground. Change R723, P/N10435-504 to a 4 turn potentiometer, P/N10443-504, 500 k, 1/2 W.
		40000-557	Add a 470 ohm, P/N10010-471 resistor from base of Q1031 to ground. Change R1066, P/N10443-100 from 10 ohm to 50 ohm, 4 turn potentiometer, P/N10443-500. Remove R1038, 5 k, P/N10435-502 and replace with jumper. Install sleeving on R1031 terminals.
4635	1-9-74	40000-557	Change R1037 from 1.3 k to 1.5 k, P/N10010-152. Delete R1060, 10 ohm, 1/4 W, 1%, P/N10710-100.
4645	1-17-74	40000-555	Add 1 k, 1/4 W, 5%, P/N10010-102 between Z706, pin 6 and junction of R724, 8.2 k and TP7B. Add 6.8 k, 1/4 W, 5%, P/N10010-682 between junction of Z707, pin 9 and R730, 2.4 k and Z705 pins 12 and 13. Add diode DP16-0, P/N22164-000 between Z705, pins 12 and 13 to ground (anode to ground).
		40000-548	Change R554 and R555 to 2.2 ohm, 1/2 W, P/N10011-229 and add asterisk. Add asterisk to R553, P/N10011-100. (Asterisk * - factory select).
4646	1-21-74	Manual	Add the following to Accuracy Specifications: Accuracy specifications apply to measurement above one percent of full scale (measurement functions only).
4652	1-28-74	40000-548	Change CR511, CR512, CR513 and CR514 from 1N4005, 600 V, 1A, P/N12194-003 to SCE1, 200 V, 1A, P/N12194-006.

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
4647	1-28-74	40000-546	Change R165 from 100 k to 1 k, P/N10435-102 and add asterisk. Add variable capacitor 7-25 pF, P/N 11305-250 across R68 and add asterisk.
TCO587	2-5-74	40000-556	Install standoff P/N15421-013 using glass bead at bottom on circuit side of board and add two (2) 3.9 k, 1/4 W resistors and one (1) 56 pF, 500 V capacitor. Cut trace between Z905, pin 1 and Z907, pins 5 and 6.
4666	2-14-74	Manual	Add the following paragraph to the beginning of Section 3.1: *WARNING* When making isolated ac and dc voltage measurements, disconnect the chassis ground coupler from the COM (neutral) banana jack.
4687	3-7-74	40000-552	Change C1256 from 0.01 µF to 0.008 µF, P/N11125-802 and add asterisk.
4703	3-29-74	40000-552	Fuse is shown across the wrong circuit. Correct per the following drawing.



607	3-29-74	40000-546	Change R17 from 1 k, P/N10010-102 to 910 ohm, P/N10010-911. Change R26 from 100 k, P/N10010-104 to 180 k, P/N10010-184 and add asterisk.

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
607 (cont.)			Change R23 and R24 from 10 ohm, P/N10010-100 to 33 ohm, P/N10010-330. Change R25 from 430 ohm, P/N10010-431 to 270 ohm, P/N10010-271 with a 200 ohm potentiometer, P/N10435-201 in series, arm and inside connected to junction of C15, R61 and R32. Do not remove asterisk from R25. Change R65 from 2.2 k, P/N10010-202 to 1.5 k, P/N10010-152. Change R68 and R72 from 3.6 k, P/N 10010-362 to 1.8 k, P/N10010-182. Change R69 and R71 from 7.5 k, P/N 10010-752 to 3.6 k, P/N10010-362. Add a 5.1 k resistor, P/N10010-512 from TP1B to -15 V (A) and add asterisk. Change R162 from 3 k, P/N10010-302 to 1.5 k, P/N10010-152 with a 2 k potentiometer, P/N10435-202 in series, arm and one side of potentiometer to -15 V (A).
		40000-548	Change CR531 thru CR534, CR555, CR556, CR571 thru CR574 from 20A1, 2A, P/N12374-001 to SS1M, 1A, P/N 12194-006.
		40000-557	Change the 470 ohm resistor, P/N 10010-471 to 220 ohms, P/N10010-221 and add asterisk (reference E.O. 4631).
TCO 613	5-8-74	50000-738	Change R1024 from 1 k, 1T potentiometer, P/N10435-102 to 500 ohm, 4T potentiometer, P/N10443-501. Change R1052 from 10 k, 4T, P/N10443-103 to 5 k, 4T, P/N10443-502. Change R1082 and R1083 from 10 k, 1T, P/N10435-103 to 10 k, 4T, P/N10443-103. Change R1111 from 1 k, 1T, P/N10435-102 to 1 k, 1T, P/N10435-102 to 1 k, 4T, P/N10443-102. Change C1061 from 0.01 µF, 500 V disc, P/N11247-103 to 0.01 µF, 200 V met. mylar. Change C1062 and C1063 from 0.022 µF, 25 V disc, P/N11241-223 to 0.01 µF, 200 V met. mylar. Install a 2.2 M, 1/4 W resistor on circuit side between leads of C1021. Use sleeving. Install a 1N995 diode, P/N12144-103 on circuit side with anode to junction of R1022 and CR1022 and cathode to junction of R1023 and CR1022. Use Sleeving.

E. O. NO.	EFFECTIVE DATE	DWG. NO.	CHANGE
4755	7-17-74	40000-546	Change C38 from 0.47 μF, 10 V disc, 106482 to 0.47 μF, 100 V, Met Mylar, 100061.
		40000-557	Change C1021 same as C38.
639	8-6-74	40000-552	Replace red and white wire between C1201 at point (HB) and pin 4 of S1201-2F with RG-174/U, P/N17090-009, length 4 inches and shield grounded at the plain board. Leave cable shield open on switch end.

DATAPULSE DIVISION
SYSTRON DONNER

SEMICONDUCTOR REPLACEMENTS
(Applicable to all Datapulse Models except the Model 102.)

SERVICE BULLETIN 1-65
Revised 8-13-73

The listed commercial diodes and transistors may be suitable replacements for the corresponding Datapulse parts, either as direct substitutes, or as selected for the special performance characteristics given. In certain cases, it may be necessary to use the Datapulse parts.

DATAPULSE TYPE NO.	DATAPULSE PART NO.	COMMERCIAL EQUIVALENT
Diodes:		
DP15-0	22154-000	1N752A selected for $\Delta V < 0.2$ V between 7 mA and 110 mA.
DP15-1	22154-001	Same as DP15-0 but matched in pairs to within 0.1 V.
DP15-201	22154-201	1N936 selected for 9.4 V $\pm$0.1 V @25 mA.
DP16-0	22164-000	1N3600
DP16-1	22164-001	(>80 V, DP16-0)
DP19-0	22194-000	1N2070/1N4005
DP19-6	22194-006	1N2071/1N4005
Transistors:		
DP46-1	22465-001	Selected for h_{fe} = 100 min.
DP59-0	22595-000	2N2904A
DP60-1	22605-001	2N2894 selected for V_{ceo} (sust) = 20 V min.
DP60-2	22605-002	2N3133
DP60-4	22605-004	2N3209
DP60-5	22605-005	FT1702
DP60-6	22605-006	2N3640
DP60-7	22605-007	2N2894 selected for V_{ceo} (sust) = 25 V
DP60-8	22605-008	2N2894A (Motorola) V_{ceo} >20
DP63-2	22635-002	Replaced by DP63-3
DP63-3	22635-003	2N2369A (Fairchild) h_{fe} >70
DP63-4	22635-004	Replaced by DP63-3
DP63-6	22635-006	2N2219A
DP63-8	22635-008	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V
DP63-9	22635-009	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V
DP64-0	22645-000	May be replaced by 2N5109 selected for $h_{fe} \geq 20$ @I_c = 0.25 A & V_c = 2.5 V

DATAPULSE DIVISION, SYSTRON-DONNER CORPORATION
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WARRANTY

The Datapulse Division, Systron-Donner Corporation (hereinafter referred to as Datapulse) warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, transistors, fuses or batteries which shall, within one year after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective.

Instruments returned under this Warranty will not be accepted at the Datapulse plant without prior authorization by a Datapulse representative or by the service manager of Datapulse.

Datapulse reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of Datapulse and Datapulse neither assumes nor authorizes any other person to assume for them any other liability in connection with the sales of Datapulse instruments.

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